WHAT IS CLAIMED IS:

1. A vibration control device, comprising:

a holding member that holds an object;

a first gas chamber that supports the holding member in a gravity direction through internal gas pressure;

a second gas chamber coupled to the first gas chamber and having a volume smaller than a volume of the first gas chamber;

a movable member that changes the volume of the second gas chamber and changes the volume of the first gas chamber; and

a drive that drives the movable member to adjust a position of the holding member in the gravity direction based on a state change of at least one of the first and second gas chambers.

2. The vibration control device of claim 1, wherein the drive comprises an electromagnetic actuator that drives the movable member.

3. The vibration control device of claim 1, wherein the movable member has a weight member that is lighter than the object.

4. The vibration control device of claim 1, wherein the second gas chamber comprises a tubular first cylinder and the movable member, which moves along an inner peripheral surface of the first tubular cylinder.

5. The vibration control device of claim 4, wherein the drive includes a gas pressure driving mechanism that drives the moveable member through gas pressure that opposes an internal gas pressure of the second gas chamber.

6. The vibration control device of claim 5, wherein:

the movable member includes a piston at an end portion of the movable member that is opposite to a portion that moves along the inner peripheral surface of the first tubular cylinder; and

the gas pressure driving mechanism includes a second cylinder having an inner peripheral surface along which the piston moves and a gas supply mechanism that supplies gas into a gas chamber formed by the piston and the second cylinder.

7. The vibration control device of claim 6, wherein the second cylinder is connected to the first cylinder.

8. The vibration control device of claim 1, wherein the movable member moves via a gas hydrostatic pressure bearing.

9. The vibration control device of claim 1, wherein the first gas chamber includes: (i) a tubular body tiltably attached to a base member so as to be tiltable about a fulcrum, and (ii) the holding member, which is arranged via a specified space on either an inner surface side or an outer surface side of the tubular body, is slidable relative to the tubular body, and has an inner bottom surface that serves as a pressure receiving surface that receives pressure of the gas, and the holding member is coupled in a state that allows pivoting of the tubular member with respect to the object.

10. The vibration control device of claim 9, wherein, among the tubular body and the holding member, a tubular peripheral wall positioned on an inner peripheral side has formed therein, at a specified spacing in a peripheral direction, a plurality of micro-apertures extending from the first gas chamber to the specified space.

11. The vibration control device of claim 1, wherein the first gas chamber is defined by: (i) a housing having an open top surface, and (ii) the holding member, which is connected to the open top surface of the housing via a first elastic member.

12. The vibration control device of claim 11, wherein a bottom wall of the housing includes first and second bottom wall members that oppose each other via a specified clearance, and an annular elastic member that connects the first and second bottom wall members and maintains the clearance.

13. The vibration control device of claim 11, wherein a bottom wall of the housing includes a frame-shaped member having an aperture in a center, a plate-shaped member arranged opposing a bottom surface side of the frame-shaped member via a specified clearance, and a gas hydrostatic pressure bearing provided between the frame-shaped member and the plate-shaped member and which maintains the specified clearance.

14. The vibration control device of claim 11, wherein:

the holding member includes a stepped tubular first member connected to the open top surface of the housing via the first elastic member in a suspended supported state, and a second member having a pressure receiving portion connected to a bottom open end of the tubular first member via an annular second elastic member and which receives, at a bottom end, internal air pressure of the first gas chamber, and

the second member includes (i) a holding portion that holds the object outside the housing, (ii) the pressure receiving portion, and (iii) a shaft portion that connects the pressure receiving portion and the holding portion and extends through an interior of the first member in a vertical direction.

15. The vibration control device of claim 14, wherein the first member includes a first tubular body connected to the pressure receiving portion via the second elastic member and is floatingly supported by the gas pressure along with the pressure receiving portion, and a second tubular body that has a lower end surface opposing an upper end surface of the first tubular body via a specified clearance, and having an upper end portion connected to the open top surface of the housing via the first elastic member.

16. The vibration control device of claim 14, wherein the first member comprises a first tubular body that is connected to the pressure receiving portion via the second elastic member and is floatingly supported by the gas pressure along with the pressure receiving portion, and a second tubular body that opposes either an inner peripheral surface or an outer peripheral surface of the first tubular body via a specified clearance and has an upper end portion connected to the open top surface of the housing via the first elastic member.

17. The vibration control device of claim 16, wherein, one of the first tubular body and the second tubular body that is positioned on an outer peripheral side has formed therein micro apertures that extend through a wall at a position opposing the other one of the tubular bodies.

18. A vibration control device, comprising:

a housing having an open top surface;

a first tubular body supported at the open top surface of the housing via an annular first elastic member and extending in a vertical direction;

a second tubular body positioned either inside or outside the first tubular body via a specified space and being relatively slidable with respect to the first tubular body;

a movable member that is connected to a lower end of the second tubular body via an annular second elastic member, has a pressure receiving portion at a lower end, the pressure receiving portion, along with the first elastic member, the first tubular body and the second elastic member defining a gas chamber, the movable member being floatingly supported by gas pressure inside the gas chamber that acts on a bottom surface of the pressure receiving portion and having a top end portion that serves as a support portion that supports the object outside the housing from below.

19. The vibration control device of claim 18, wherein, one of the first and second tubular bodies that is positioned at an outer peripheral side has formed therein, at a specified interval along a peripheral direction, micro apertures that connect the gas chamber and the specified space.

20. The vibration control device of claim 18, wherein the first and second tubular bodies comprise cylindrical tubular bodies, the vibration control device further comprising:

a first support mechanism that includes: a first support member mounted on an upper end of the first tubular body; a support arm that is mounted on an open end portion of the housing and has a support point that supports a center of the first support member from below; and a coupling mechanism that integrally couples the first tubular body to the support arm at the support point in a manner that allows only rotation of the first tubular body; and

a second support mechanism that includes a second support member mounted inside the second tubular body, and a coupling mechanism that couples the pressure receiving portion of the movable member to the second support member at a coupling point at a center of the second support member in a manner that allows only rotation.

21. The vibration control device of claim 20, wherein the coupling point is set at a position that matches a rotational center of the second elastic member.

22. The vibration control device of claims 21, further comprising an elastic urging member that urges the support arm in a direction that suppresses rotation of the first tubular body with respect to the support arm between the support arm and the first support member.

23. The vibration control device of claim 18, further comprising an adjusting device that includes a separate chamber that is connected to the gas chamber and has a volume smaller than a volume of the gas chamber, the volume being variable by displacement of a movable member that forms part of the adjusting device, the position of the movable member in a gravity direction being adjusted by variation of the volume of the separate chamber and the gas chamber connected thereto according to positional variation of the movable member.

24. The vibration control device of claim 23, wherein the separate chamber is formed by a cylindrical tubular cylinder and the movable member, which moves along an inner peripheral surface of the tubular cylinder.

25. The vibration control device of claim 23, wherein the movable member has a weight member that is lighter than the object.

26. The vibration control device of claim 23, wherein the adjusting device includes an electromagnetic actuator that drives the movable member.

27. A stage device, comprising:

a stage that is movable in a specified direction;

a table arranged above the stage; and

at least three vibration control devices, at least one of which is the vibration control device of claim 9, and that holds the table above the stage.

28. The stage device of claim 27, wherein each of the at least three vibration control devices is the vibration control device of claim 9.

29. The stage device of claim 27, further comprising:

a first micro driving mechanism that micro-drives the table in a horizontal plane; and

a second micro driving mechanism that micro-drives the table in a direction perpendicular to the horizontal plane and in an inclined direction with respect to the horizontal plane.

30. An exposure apparatus that exposes a photosensitive object through an energy beam and forms a specified pattern on the photosensitive object, comprising:

at least three vibration control devices, each corresponding to the vibration control device according to claim 1, and that hold at least a portion of the structural components that form the exposure apparatus main body by which the exposure is carried out at least at three points.

31. The exposure apparatus of claim 30, wherein:

the exposure apparatus main body includes a mask stage that holds a mask in which is formed the specified pattern, an object stage on which the photosensitive object is mounted, and a body including a mask stage base on which is formed a movement surface of the mask stage and an object stage base on which is formed a movement surface of the object stage, and

at least a portion of the body is held by the vibration control device.

32. The exposure apparatus of claim 30, wherein the exposure apparatus main body includes a projection optical system that projects the energy beam, which has passed through the mask, onto the photosensitive object, the projection optical system being held by the vibration control devices.

33. An exposure apparatus that exposes a photosensitive object through an energy beam and forms a specified pattern on the photosensitive object, comprising:

at least three vibration control devices, each corresponding to the vibration control device according to claim 18, and that hold at least a portion of the structural components that form the exposure apparatus main body by which the exposure is carried out at least at three points.

34. The exposure apparatus of claim 33, wherein:

the exposure apparatus main body includes a mask stage that holds a mask in which is formed the specified pattern, an object stage on which the photosensitive object is mounted, and a body including a mask stage base on which is formed a movement surface of the mask stage and an object stage base on which is formed a movement surface of the object stage, and

at least a portion of the body is held by the vibration control device.

35. The exposure apparatus of claim 33, wherein the exposure apparatus main body includes a projection optical system that projects the energy beam, which has passed through the mask, onto the photosensitive object, the projection optical system being held by the vibration control devices.